

# The Unicode® Standard

## Version 15.0 – Core Specification

To learn about the latest version of the Unicode Standard, see <https://www.unicode.org/versions/latest/>.

Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and the publisher was aware of a trademark claim, the designations have been printed with initial capital letters or in all capitals.

Unicode and the Unicode Logo are registered trademarks of Unicode, Inc., in the United States and other countries.

The authors and publisher have taken care in the preparation of this specification, but make no expressed or implied warranty of any kind and assume no responsibility for errors or omissions. No liability is assumed for incidental or consequential damages in connection with or arising out of the use of the information or programs contained herein.

The *Unicode Character Database* and other files are provided as-is by Unicode, Inc. No claims are made as to fitness for any particular purpose. No warranties of any kind are expressed or implied. The recipient agrees to determine applicability of information provided.

© 2022 Unicode, Inc.

All rights reserved. This publication is protected by copyright, and permission must be obtained from the publisher prior to any prohibited reproduction. For information regarding permissions, inquire at <https://www.unicode.org/reporting.html>. For information about the Unicode terms of use, please see <https://www.unicode.org/copyright.html>.

The Unicode Standard / the Unicode Consortium; edited by the Unicode Consortium. — Version 15.0.

Includes index.

ISBN 978-1-936213-32-0 (<https://www.unicode.org/versions/Unicode15.0.0/>)

1. Unicode (Computer character set) I. Unicode Consortium.

QA268.U545 2022

ISBN 978-1-936213-32-0

Published in Mountain View, CA

September 2022

# Contents

<b>Preface</b> .....	xxi
Why Unicode? .....	xxi
Organization of This Standard .....	xxi
The Unicode Character Database .....	xxii
Unicode Code Charts .....	xxiii
Unicode Standard Annexes .....	xxiii
Unicode Technical Standards and Unicode Technical Reports .....	xxiv
Updates and Errata .....	xxv
Acknowledgements .....	xxv
<b>1 Introduction</b> .....	1
<b>1.1 Coverage</b> .....	3
Standards Coverage .....	3
New Characters .....	3
<b>1.2 Design Goals</b> .....	4
<b>1.3 Text Handling</b> .....	6
Characters and Glyphs .....	6
Text Elements .....	6
<b>2 General Structure</b> .....	9
<b>2.1 Architectural Context</b> .....	10
Basic Text Processes .....	10
Text Elements, Characters, and Text Processes .....	10
Text Processes and Encoding .....	11
<b>2.2 Unicode Design Principles</b> .....	14
Universality .....	14
Efficiency .....	15
Characters, Not Glyphs .....	15
Semantics .....	18
Plain Text .....	18
Logical Order .....	19
Unification .....	21
Dynamic Composition .....	23
Stability .....	23
Convertibility .....	24
<b>2.3 Compatibility Characters</b> .....	25
Compatibility Variants .....	26
Compatibility Decomposable Characters .....	26
<b>2.4 Code Points and Characters</b> .....	29
Types of Code Points .....	30

<b>2.5</b>	<b>Encoding Forms</b> .....	33
	UTF-32 .....	35
	UTF-16 .....	36
	UTF-8 .....	37
<b>2.6</b>	<b>Encoding Schemes</b> .....	39
<b>2.7</b>	<b>Unicode Strings</b> .....	42
<b>2.8</b>	<b>Unicode Allocation</b> .....	43
	Planes .....	43
	Allocation Areas and Blocks .....	44
	Assignment of Code Points .....	45
<b>2.9</b>	<b>Details of Allocation</b> .....	47
	Plane 0 (BMP) .....	48
	Plane 1 (SMP) .....	50
	Plane 2 (SIP) .....	51
	Plane 3 (TIP) .....	51
	Other Planes .....	51
<b>2.10</b>	<b>Writing Direction</b> .....	52
<b>2.11</b>	<b>Combining Characters</b> .....	54
	Sequence of Base Characters and Combining Characters .....	55
	Multiple Combining Characters .....	56
	Ligated Multiple Base Characters .....	59
	Exhibiting Nonspacing Marks in Isolation .....	60
	“Characters” and Grapheme Clusters .....	60
<b>2.12</b>	<b>Equivalent Sequences</b> .....	61
	Normalization .....	61
	Decompositions .....	62
	Non-decomposition of Certain Diacritics .....	64
<b>2.13</b>	<b>Special Characters</b> .....	66
	Special Noncharacter Code Points .....	66
	Byte Order Mark (BOM) .....	66
	Layout and Format Control Characters .....	67
	The Replacement Character .....	67
	Control Codes .....	67
<b>2.14</b>	<b>Conforming to the Unicode Standard</b> .....	68
	Characteristics of Conformant Implementations .....	68
	Unacceptable Behavior .....	69
	Acceptable Behavior .....	69
	Supported Subsets .....	70
<b>3</b>	<b>Conformance</b> .....	71
<b>3.1</b>	<b>Versions of the Unicode Standard</b> .....	72
	Stability .....	72
	Version Numbering .....	73
	Errata and Corrigenda .....	74

	References to the Unicode Standard .....	74
	Precision in Version Citation .....	75
	References to Unicode Character Properties .....	75
	References to Unicode Algorithms .....	76
<b>3.2</b>	<b>Conformance Requirements</b> .....	<b>77</b>
	Code Points Unassigned to Abstract Characters .....	77
	Interpretation .....	78
	Modification .....	79
	Character Encoding Forms .....	80
	Character Encoding Schemes .....	81
	Bidirectional Text .....	82
	Normalization Forms .....	82
	Normative References .....	82
	Unicode Algorithms .....	82
	Default Casing Algorithms .....	83
	Unicode Standard Annexes .....	83
<b>3.3</b>	<b>Semantics</b> .....	<b>85</b>
	Definitions .....	85
	Character Identity and Semantics .....	85
<b>3.4</b>	<b>Characters and Encoding</b> .....	<b>88</b>
<b>3.5</b>	<b>Properties</b> .....	<b>93</b>
	Types of Properties .....	93
	Property Values .....	94
	Default Property Values .....	95
	Classification of Properties by Their Values .....	96
	Property Status .....	97
	Context Dependence .....	100
	Stability of Properties .....	101
	Simple and Derived Properties .....	102
	Property Aliases .....	103
	Private Use .....	104
<b>3.6</b>	<b>Combination</b> .....	<b>105</b>
	Combining Character Sequences .....	105
	Grapheme Clusters .....	108
	Application of Combining Marks .....	109
<b>3.7</b>	<b>Decomposition</b> .....	<b>115</b>
	Compatibility Decomposition .....	115
	Canonical Decomposition .....	116
<b>3.8</b>	<b>Surrogates</b> .....	<b>118</b>
<b>3.9</b>	<b>Unicode Encoding Forms</b> .....	<b>119</b>
	UTF-32 .....	123
	UTF-16 .....	124
	UTF-8 .....	124

	Encoding Form Conversion . . . . .	126
	Constraints on Conversion Processes . . . . .	126
	U+FFFD Substitution of Maximal Subparts . . . . .	127
<b>3.10</b>	<b>Unicode Encoding Schemes</b> . . . . .	<b>130</b>
<b>3.11</b>	<b>Normalization Forms</b> . . . . .	<b>134</b>
	Normalization Stability . . . . .	134
	Combining Classes . . . . .	135
	Specification of Unicode Normalization Forms . . . . .	136
	Starters . . . . .	136
	Canonical Ordering Algorithm . . . . .	137
	Canonical Composition Algorithm . . . . .	138
	Definition of Normalization Forms . . . . .	140
<b>3.12</b>	<b>Conjoining Jamo Behavior</b> . . . . .	<b>142</b>
	Definitions . . . . .	142
	Hangul Syllable Decomposition . . . . .	144
	Hangul Syllable Composition . . . . .	146
	Hangul Syllable Name Generation . . . . .	147
	Sample Code for Hangul Algorithms . . . . .	148
<b>3.13</b>	<b>Default Case Algorithms</b> . . . . .	<b>152</b>
	Definitions . . . . .	152
	Default Case Conversion . . . . .	154
	Default Case Folding . . . . .	155
	Default Case Detection . . . . .	156
	Default Caseless Matching . . . . .	157
<b>4</b>	<b>Character Properties</b> . . . . .	<b>159</b>
<b>4.1</b>	<b>Unicode Character Database</b> . . . . .	<b>161</b>
<b>4.2</b>	<b>Case</b> . . . . .	<b>164</b>
	Definitions of Case and Casing . . . . .	164
	Case Mapping . . . . .	166
<b>4.3</b>	<b>Combining Classes</b> . . . . .	<b>168</b>
	Reordrant, Split, and Subjoined Combining Marks . . . . .	168
<b>4.4</b>	<b>Directionality</b> . . . . .	<b>171</b>
<b>4.5</b>	<b>General Category</b> . . . . .	<b>172</b>
<b>4.6</b>	<b>Numeric Value</b> . . . . .	<b>175</b>
	Ideographic Numeric Values . . . . .	176
<b>4.7</b>	<b>Bidi Mirrored</b> . . . . .	<b>178</b>
<b>4.8</b>	<b>Name</b> . . . . .	<b>180</b>
	Unicode Name Property . . . . .	183
	Code Point Labels . . . . .	186
	Use of Character Names in APIs and User Interfaces . . . . .	186
<b>4.9</b>	<b>Unicode 1.0 Names</b> . . . . .	<b>188</b>
<b>4.10</b>	<b>Letters, Alphabetic, and Ideographic</b> . . . . .	<b>189</b>

4.11	<b>Properties for Text Boundaries</b>	190
4.12	<b>Characters with Unusual Properties</b>	191
5	<b>Implementation Guidelines</b>	195
5.1	<b>Data Structures for Character Conversion</b>	196
	Issues	196
	Multistage Tables	196
5.2	<b>Programming Languages and Data Types</b>	199
	Unicode Data Types for C	199
5.3	<b>Unknown and Missing Characters</b>	201
5.4	<b>Handling Surrogate Pairs in UTF-16</b>	203
5.5	<b>Handling Numbers</b>	205
5.6	<b>Normalization</b>	206
5.7	<b>Compression</b>	208
5.8	<b>Newline Guidelines</b>	209
	Definitions	209
	Line Separator and Paragraph Separator	210
	Recommendations	211
5.9	<b>Regular Expressions</b>	214
5.10	<b>Language Information in Plain Text</b>	215
	Requirements for Language Tagging	215
	Language Tags and Han Unification	215
5.11	<b>Editing and Selection</b>	217
	Consistent Text Elements	217
5.12	<b>Strategies for Handling Nonspacing Marks</b>	219
	Keyboard Input	220
	Truncation	220
5.13	<b>Rendering Nonspacing Marks</b>	222
	Canonical Equivalence	225
	Positioning Methods	226
5.14	<b>Locating Text Element Boundaries</b>	228
5.15	<b>Identifiers</b>	229
5.16	<b>Sorting and Searching</b>	230
	Culturally Expected Sorting and Searching	230
	Language-Insensitive Sorting	230
	Searching	231
	Sublinear Searching	232
5.17	<b>Binary Order</b>	233
	UTF-8 in UTF-16 Order	233
	UTF-16 in UTF-8 Order	234

<b>5.18</b>	<b>Case Mappings</b> .....	236
	Titlecasing .....	236
	Complications for Case Mapping .....	237
	Reversibility .....	239
	Caseless Matching .....	240
	Normalization and Casing .....	242
<b>5.19</b>	<b>Mapping Compatibility Variants</b> .....	243
<b>5.20</b>	<b>Unicode Security</b> .....	245
<b>5.21</b>	<b>Ignoring Characters in Processing</b> .....	248
	Characters Ignored in Text Segmentation .....	248
	Characters Ignored in Line Breaking .....	249
	Characters Ignored in Cursive Joining .....	249
	Characters Ignored in Identifiers .....	249
	Characters Ignored in Searching and Sorting .....	250
	Characters Ignored for Display .....	250
<b>5.22</b>	<b>U+FFFD Substitution in Conversion</b> .....	255
<b>6</b>	<b>Writing Systems and Punctuation</b> .....	257
<b>6.1</b>	<b>Writing Systems</b> .....	258
<b>6.2</b>	<b>General Punctuation</b> .....	264
	Blocks Devoted to Punctuation .....	265
	Format Control Characters .....	266
	Space Characters .....	267
	Dashes and Hyphens .....	268
	Paired Punctuation .....	270
	Language-Based Usage of Quotation Marks .....	271
	Apostrophes .....	275
	Other Punctuation .....	276
	Archaic Punctuation and Editorial Marks .....	281
	Indic Punctuation .....	283
	CJK Punctuation .....	286
	Unknown or Unavailable Ideographs .....	287
	CJK Compatibility Forms .....	288
<b>7</b>	<b>Europe-I</b> .....	289
	<b>Modern and Liturgical Scripts</b>	
<b>7.1</b>	<b>Latin</b> .....	291
	Letters of Basic Latin: U+0041–U+007A .....	295
	Letters of the Latin-1 Supplement: U+00C0–U+00FF .....	295
	Latin Extended-A: U+0100–U+017F .....	295
	Latin Extended-B: U+0180–U+024F .....	296
	IPA Extensions: U+0250–U+02AF .....	298
	Phonetic Extensions: U+1D00–U+1DBF .....	300
	Latin Extended Additional: U+1E00–U+1EFF .....	301
	Latin Extended-C: U+2C60–U+2C7F .....	301

	Latin Extended-D: U+A720–U+A7FF	302
	Latin Extended-E: U+AB30–U+AB6F	303
	Latin Extended-F: U+10780–U+107BF	304
	Latin Ligatures: U+FB00–U+FB06	304
<b>7.2</b>	<b>Greek</b>	305
	Greek: U+0370–U+03FF	305
	Greek Extended: U+1F00–U+1FFF	309
	Ancient Greek Numbers: U+10140–U+1018F	310
<b>7.3</b>	<b>Coptic</b>	312
<b>7.4</b>	<b>Cyrillic</b>	315
	Cyrillic: U+0400–U+04FF	315
	Cyrillic Supplement: U+0500–U+052F	317
	Cyrillic Extended-A: U+2DE0–U+2DFF	317
	Cyrillic Extended-B: U+A640–U+A69F	318
	Cyrillic Extended-C: U+1C80–U+1C8F	318
	Cyrillic Extended-D: U+1E030–U+1E08F	319
<b>7.5</b>	<b>Glagolitic</b>	320
	Glagolitic: U+2C00–U+2C5F	320
	Glagolitic Supplement: U+1E000–U+1E02F	320
<b>7.6</b>	<b>Armenian</b>	321
<b>7.7</b>	<b>Georgian</b>	323
	Georgian: U+10A0–U+10FF	323
	Georgian Extended: U+1C90–U+1CBF	323
	Georgian Supplement: U+2D00–U+2D2F	323
<b>7.8</b>	<b>Modifier Letters</b>	325
	Spacing Modifier Letters: U+02B0–U+02FF	326
	Modifier Tone Letters: U+A700–U+A71F	328
<b>7.9</b>	<b>Combining Marks</b>	329
	Combining Diacritical Marks: U+0300–U+036F	334
	Combining Diacritical Marks Extended: U+1AB0–U+1AFF	335
	Combining Diacritical Marks Supplement: U+1DC0–U+1DFF	336
	Combining Diacritical Marks for Symbols: U+20D0–U+20FF	336
	Combining Half Marks: U+FE20–U+FE2F	337
	Combining Marks in Other Blocks	338
<b>8</b>	<b>Europe-II</b>	341
	<b>Ancient and Other Scripts</b>	
<b>8.1</b>	<b>Linear A</b>	343
<b>8.2</b>	<b>Linear B</b>	344
	Linear B Syllabary: U+10000–U+1007F	344
	Linear B Ideograms: U+10080–U+100FF	344
	Aegean Numbers: U+10100–U+1013F	344
<b>8.3</b>	<b>Cypriot Syllabary</b>	346



<b>8.4</b>	<b>Cypro-Minoan</b> .....	347
<b>8.5</b>	<b>Ancient Anatolian Alphabets</b> .....	348
	Lycian: U+10280–U+1029F .....	348
	Carian: U+102A0–U+102DF .....	348
	Lydian: U+10920–U+1093F .....	348
<b>8.6</b>	<b>Old Italic</b> .....	350
<b>8.7</b>	<b>Runic</b> .....	353
<b>8.8</b>	<b>Old Hungarian</b> .....	356
<b>8.9</b>	<b>Gothic</b> .....	357
<b>8.10</b>	<b>Elbasan</b> .....	358
<b>8.11</b>	<b>Caucasian Albanian</b> .....	359
<b>8.12</b>	<b>Vithkuqi</b> .....	360
<b>8.13</b>	<b>Old Permic</b> .....	361
<b>8.14</b>	<b>Ogham</b> .....	362
<b>8.15</b>	<b>Shavian</b> .....	363
<b>9</b>	<b>Middle East-I</b> .....	365
	<b>Modern and Liturgical Scripts</b>	
<b>9.1</b>	<b>Hebrew</b> .....	367
	Hebrew: U+0590–U+05FF .....	367
	Alphabetic Presentation Forms: U+FB1D–U+FB4F .....	371
<b>9.2</b>	<b>Arabic</b> .....	373
	Arabic: U+0600–U+06FF .....	373
	Arabic Cursive Joining .....	382
	Arabic Ligatures .....	385
	Arabic Joining Groups .....	387
	Combining Hamza .....	395
	Other Letters for Extended Arabic .....	397
	Arabic Letters in Other Languages .....	397
	Arabic Supplement: U+0750–U+077F .....	398
	Arabic Extended-A: U+08A0–U+08FF .....	398
	Arabic Presentation Forms-A: U+FB50–U+FDFF .....	398
	Arabic Presentation Forms-B: U+FE70–U+FEFF .....	400
<b>9.3</b>	<b>Syriac</b> .....	401
	Syriac: U+0700–U+074F .....	401
	Syriac Shaping .....	405
	Syriac Supplement: U+0860–U+086F .....	410
<b>9.4</b>	<b>Samaritan</b> .....	411
<b>9.5</b>	<b>Mandaic</b> .....	413
<b>9.6</b>	<b>Yezidi</b> .....	416

<b>10 Middle East-II</b> .....	417
<b>Ancient Scripts</b>	
<b>10.1 Old North Arabian</b> .....	419
<b>10.2 Old South Arabian</b> .....	420
<b>10.3 Phoenician</b> .....	422
<b>10.4 Imperial Aramaic</b> .....	424
<b>10.5 Manichaean</b> .....	426
<b>10.6 Pahlavi and Parthian</b> .....	430
Inscriptional Parthian: U+10B40–U+10B5F.....	430
Inscriptional Pahlavi: U+10B60–U+10B7F.....	430
Psalter Pahlavi: U+10B80–U+10BAF.....	431
<b>10.7 Avestan</b> .....	432
<b>10.8 Chorasmian</b> .....	434
<b>10.9 Elymaic</b> .....	435
<b>10.10 Nabataean</b> .....	436
<b>10.11 Palmyrene</b> .....	437
<b>10.12 Hatran</b> .....	438
<b>11 Cuneiform and Hieroglyphs</b> .....	439
<b>11.1 Sumero-Akkadian</b> .....	440
Cuneiform: U+12000–U+123FF.....	440
Cuneiform Numbers and Punctuation: U+12400–U+1247F.....	443
Early Dynastic Cuneiform: U+12480–U+1254F.....	443
<b>11.2 Ugaritic</b> .....	444
<b>11.3 Old Persian</b> .....	445
<b>11.4 Egyptian Hieroglyphs</b> .....	446
Egyptian Hieroglyphs: U+13000–U+1342F.....	446
Egyptian Hieroglyph Format Controls: U+13430–U+1345F.....	448
Editorial Marks.....	453
<b>11.5 Meroitic</b> .....	456
<b>11.6 Anatolian Hieroglyphs</b> .....	458
<b>12 South and Central Asia-I</b> .....	461
<b>Official Scripts of India</b>	
<b>12.1 Devanagari</b> .....	463
Devanagari: U+0900–U+097F.....	463
Principles of the Devanagari Script.....	464
Rendering Devanagari.....	473
Devanagari Digits, Punctuation, and Symbols.....	483
Extensions in the Main Devanagari Block.....	483
Devanagari Extended: U+A8E0–U+A8FF.....	485
Devanagari Extended-A: U+11B00–U+11B5F.....	487
Vedic Extensions: U+1CD0–U+1CFF.....	487

<b>12.2 Bengali (Bangla)</b> .....	489
<b>12.3 Gurmukhi</b> .....	496
<b>12.4 Gujarati</b> .....	501
<b>12.5 Oriya (Odia)</b> .....	503
<b>12.6 Tamil</b> .....	507
Tamil: U+0B80–U+0BFF .....	507
Tamil Vowels .....	508
Tamil Ligatures .....	510
Tamil Supplement: U+11FC0–U+11FFF .....	514
Tamil Named Character Sequences .....	514
<b>12.7 Telugu</b> .....	517
<b>12.8 Kannada</b> .....	520
Kannada: U+0C80–U+0CFF .....	520
Principles of the Kannada Script .....	520
Rendering Kannada .....	522
<b>12.9 Malayalam</b> .....	524
Malayalam: U+0D00–U+0D7F .....	524
Malayalam Orthographic Reform .....	525
Rendering Malayalam .....	526
Malayalam Numbers and Punctuation .....	531
<b>13 South and Central Asia-II</b> .....	533
<b>Other Modern Scripts</b>	
<b>13.1 Thaana</b> .....	535
<b>13.2 Sinhala</b> .....	537
Sinhala: U+0D80–U+0DFF .....	537
Sinhala Archaic Numbers: U+111E0–U+111FF .....	540
<b>13.3 Newa</b> .....	541
<b>13.4 Tibetan</b> .....	544
<b>13.5 Mongolian</b> .....	555
Mongolian: U+1800–U+18AF .....	555
Mongolian Supplement: U+11660–U+1167F .....	564
<b>13.6 Limbu</b> .....	565
<b>13.7 Meetei Mayek</b> .....	569
Meetei Mayek: U+ABC0–U+ABFF .....	569
Meetei Mayek Extensions: U+AAE0–U+AAF6 .....	570
<b>13.8 Mro</b> .....	571
<b>13.9 Warang Citi</b> .....	572
<b>13.10 Ol Chiki</b> .....	573
<b>13.11 Chakma</b> .....	575
<b>13.12 Lepcha</b> .....	576
<b>13.13 Saurashtra</b> .....	579

13.14 Masaram Gondi .....	580
13.15 Gunjala Gondi.....	582
13.16 Wancho .....	584
13.17 Toto .....	585
13.18 Tangsa.....	586
14 South and Central Asia-III .....	587
<b>Ancient Scripts</b>	
14.1 Brahmi .....	589
14.2 Kharoshthi.....	593
Kharoshthi: U+10A00–U+10A5F .....	593
Rendering Kharoshthi .....	595
14.3 Bhaiksuki .....	599
14.4 Phags-pa .....	601
14.5 Marchen.....	608
14.6 Zanabazar Square .....	609
14.7 Soyombo .....	612
14.8 Old Turkic .....	614
14.9 Old Sogdian.....	615
14.10 Sogdian.....	616
14.11 Old Uyghur .....	617
15 South and Central Asia-IV .....	619
<b>Other Historic Scripts</b>	
15.1 Syloti Nagri .....	622
15.2 Kaithi.....	624
15.3 Sharada .....	627
15.4 Takri.....	629
15.5 Siddham.....	631
15.6 Mahajani.....	633
15.7 Khojki.....	635
15.8 Nag Mundari .....	637
15.9 Khudawadi.....	638
15.10 Multani.....	640
15.11 Tirhuta .....	641
15.12 Modi.....	644
15.13 Nandinagari .....	647
Nandinagari: U+119A0–U+119FF .....	647
15.14 Grantha .....	649
Grantha: U+11300–U+1137F .....	649
Rendering Grantha .....	649

15.15 Dives Akuru.....	653
15.16 Ahom.....	655
15.17 Sora Sompeng.....	657
15.18 Dogra.....	658
<b>16 Southeast Asia-I.....</b>	<b>661</b>
<b>Thailand, Laos, Myanmar, Cambodia, Vietnam</b>	
16.1 Thai.....	663
16.2 Lao.....	667
16.3 Myanmar.....	670
Myanmar: U+1000–U+109F.....	670
Myanmar Extended-A: U+AA60–U+AA7F.....	674
Khamti Shan.....	674
Aiton and Phake.....	676
Myanmar Extended-B: U+A9E0–U+A9FF.....	676
16.4 Khmer.....	677
Khmer: U+1780–U+17FF.....	677
Principles of the Khmer Script.....	677
Khmer Symbols: U+19E0–U+19FF.....	688
16.5 Tai Le.....	689
16.6 New Tai Lue.....	691
16.7 Tai Tham.....	694
16.8 Tai Viet.....	697
16.9 Kayah Li.....	700
16.10 Cham.....	701
16.11 Pahawh Hmong.....	703
16.12 Nyiakeng Puachue Hmong.....	705
16.13 Pau Cin Hau.....	707
16.14 Hanifi Rohingya.....	708
<b>17 Southeast Asia-II.....</b>	<b>709</b>
<b>Indonesia and the Philippines</b>	
17.1 Philippine Scripts.....	710
Tagalog: U+1700–U+171F.....	710
Hanunóo: U+1720–U+173F.....	710
Buhid: U+1740–U+175F.....	710
Tagbanwa: U+1760–U+177F.....	710
Principles of the Philippine Scripts.....	710
17.2 Buginese.....	713
17.3 Balinese.....	715
17.4 Javanese.....	721
17.5 Rejang.....	724

<b>17.6</b>	<b>Batak</b> .....	725
<b>17.7</b>	<b>Sundanese</b> .....	727
	Sundanese: U+1B80–U+1BBF .....	727
	Sundanese Supplement: U+1CC0–U+1CCF .....	729
<b>17.8</b>	<b>Makasar</b> .....	730
<b>17.9</b>	<b>Kawi</b> .....	732
<b>18</b>	<b>East Asia</b> .....	737
<b>18.1</b>	<b>Han</b> .....	740
	CJK Unified Ideographs .....	740
	Blocks Containing Han Ideographs .....	741
	General Characteristics of Han Ideographs .....	744
	Principles of Han Unification .....	748
	Unification Rules .....	749
	Abstract Shape .....	750
	Han Ideograph Arrangement .....	752
	Radical-Stroke Indices .....	753
	Mappings for Han Ideographs .....	754
	CJK Compatibility Ideographs: U+F900–U+FAFF .....	755
	CJK Compatibility Supplement: U+2F800–U+2FA1D .....	756
	Kanbun: U+3190–U+319F .....	756
	Symbols Derived from Han Ideographs .....	756
	CJK and Kangxi Radicals: U+2E80–U+2FD5 .....	757
	CJK Additions from HKSCS and GB 18030 .....	758
	CJK Strokes: U+31C0–U+31EF .....	758
	Ideographic Symbols and Punctuation: U+16FE0–U+16FFF .....	759
<b>18.2</b>	<b>Ideographic Description Characters</b> .....	760
<b>18.3</b>	<b>Bopomofo</b> .....	764
<b>18.4</b>	<b>Hiragana and Katakana</b> .....	767
	Hiragana: U+3040–U+309F .....	767
	Katakana: U+30A0–U+30FF .....	767
	Katakana Phonetic Extensions: U+31F0–U+31FF .....	768
	Small Kana Extension: U+1B130–U+1B16F .....	768
	Kana Supplement: U+1B000–U+1B0FF .....	768
	Kana Extended-A: U+1B100–U+1B12F .....	768
	Kana Extended-B: U+1AFF0–U+1AFFF .....	770
<b>18.5</b>	<b>Halfwidth and Fullwidth Forms</b> .....	773
<b>18.6</b>	<b>Hangul</b> .....	774
	Hangul Jamo: U+1100–U+11FF .....	774
	Hangul Jamo Extended-A: U+A960–U+A97F .....	775
	Hangul Jamo Extended-B: U+D7B0–U+D7FF .....	775
	Hangul Compatibility Jamo: U+3130–U+318F .....	775
	Hangul Syllables: U+AC00–U+D7A3 .....	776
<b>18.7</b>	<b>Yi</b> .....	778

<b>18.8</b>	<b>Nüshu</b> .....	781
<b>18.9</b>	<b>Lisu</b> .....	782
<b>18.10</b>	<b>Miao</b> .....	785
<b>18.11</b>	<b>Tangut</b> .....	787
	Tangut: U+17000–U+187FF .....	787
	Tangut Supplement: U+18D00–U+18D8F .....	787
	Tangut Components: U+18800–U+18AFF .....	788
<b>18.12</b>	<b>Khitan Small Script</b> .....	790
<b>19</b>	<b>Africa</b> .....	793
<b>19.1</b>	<b>Ethiopic</b> .....	794
	Ethiopic: U+1200–U+137F .....	794
	Ethiopic Extensions .....	797
<b>19.2</b>	<b>Osmanya</b> .....	798
<b>19.3</b>	<b>Tifinagh</b> .....	799
<b>19.4</b>	<b>N’Ko</b> .....	802
<b>19.5</b>	<b>Vai</b> .....	807
<b>19.6</b>	<b>Bamum</b> .....	809
	Bamum: U+A6A0–U+A6FF .....	809
	Bamum Supplement: U+16800–U+16A3F .....	809
<b>19.7</b>	<b>Bassa Vah</b> .....	811
<b>19.8</b>	<b>Mende Kikakui</b> .....	812
<b>19.9</b>	<b>Adlam</b> .....	814
<b>19.10</b>	<b>Medefaidrin</b> .....	816
<b>20</b>	<b>Americas</b> .....	817
<b>20.1</b>	<b>Cherokee</b> .....	818
<b>20.2</b>	<b>Canadian Aboriginal Syllabics</b> .....	820
	Unified Canadian Aboriginal Syllabics: U+1400–U+167F .....	820
	Unified Canadian Aboriginal Syllabics Extended: U+18B0–U+18FF .....	821
	Unified Canadian Aboriginal Syllabics Extended-A: U+11AB0–U+11ABF .....	821
<b>20.3</b>	<b>Osage</b> .....	822
<b>20.4</b>	<b>Deseret</b> .....	823
<b>21</b>	<b>Notational Systems</b> .....	827
<b>21.1</b>	<b>Braille</b> .....	828
<b>21.2</b>	<b>Western Musical Symbols</b> .....	830
<b>21.3</b>	<b>Byzantine Musical Symbols</b> .....	836
<b>21.4</b>	<b>Znamenny Musical Notation</b> .....	837
<b>21.5</b>	<b>Ancient Greek Musical Notation</b> .....	838
<b>21.6</b>	<b>Duployan</b> .....	841
	Duployan: U+1BC00–U+1BC9F .....	841
	Shorthand Format Controls: U+1BCA0–U+1BCAF .....	842

<b>21.7</b>	<b>Sutton SignWriting</b> .....	843
	Sutton SignWriting: U+1D800–U+1DAAF .....	843
<b>22</b>	<b>Symbols</b> .....	845
<b>22.1</b>	<b>Currency Symbols</b> .....	847
	Currency Symbols: U+20A0–U+20CF .....	847
<b>22.2</b>	<b>Letterlike Symbols</b> .....	851
	Letterlike Symbols: U+2100–U+214F .....	851
	Mathematical Alphanumeric Symbols: U+1D400–U+1D7FF .....	852
	Mathematical Alphabets .....	853
	Fonts Used for Mathematical Alphabets .....	856
	Arabic Mathematical Alphabetic Symbols: U+1EE00–U+1EEFF .....	857
<b>22.3</b>	<b>Numerals</b> .....	859
	Decimal Digits .....	859
	Other Digits .....	861
	Non-Decimal Radix Systems .....	864
	Acrophonic Systems and Other Letter-based Numbers .....	865
	Coptic Epact Numbers: U+102E0–U+102FF .....	866
	Rumi Numeral Symbols: U+10E60–U+10E7E .....	867
	Siyaq Numerical Notation Systems .....	868
	CJK Numerals .....	869
	Fractions .....	870
	Common Indic Number Forms: U+A830–U+A83F .....	871
<b>22.4</b>	<b>Superscript and Subscript Symbols</b> .....	873
	Superscripts and Subscripts: U+2070–U+209F .....	873
<b>22.5</b>	<b>Mathematical Symbols</b> .....	875
	Mathematical Operators: U+2200–U+22FF .....	876
	Supplements to Mathematical Symbols and Arrows .....	879
	Supplemental Mathematical Operators: U+2A00–U+2AFF .....	879
	Miscellaneous Mathematical Symbols-A: U+27C0–U+27EF .....	879
	Miscellaneous Mathematical Symbols-B: U+2980–U+29FF .....	880
	Miscellaneous Symbols and Arrows: U+2B00–U+2B7F .....	881
	Arrows: U+2190–U+21FF .....	881
	Supplemental Arrows .....	882
	Standardized Variants of Mathematical Symbols .....	882
<b>22.6</b>	<b>Invisible Mathematical Operators</b> .....	883
<b>22.7</b>	<b>Technical Symbols</b> .....	884
	Control Pictures: U+2400–U+243F .....	884
	Miscellaneous Technical: U+2300–U+23FF .....	884
	Optical Character Recognition: U+2440–U+245F .....	887
	Symbols for Legacy Computing: U+1FB00–U+1FBFF .....	888



<b>22.8 Geometrical Symbols</b> .....	889
Box Drawing and Block Elements .....	889
Geometric Shapes: U+25A0–U+25FF .....	890
Geometric Shapes Extended: U+1F780–U+1F7FF .....	891
<b>22.9 Miscellaneous Symbols</b> .....	893
Miscellaneous Symbols and Pictographs .....	895
Emoticons: U+1F600–U+1F64F .....	898
Transport and Map Symbols: U+1F680–U+1F6FF .....	898
Dingbats: U+2700–U+27BF .....	898
Ornamental Dingbats: U+1F650–U+1F67F .....	899
Alchemical Symbols: U+1F700–U+1F77F .....	900
Mahjong Tiles: U+1F000–U+1F02F .....	900
Domino Tiles: U+1F030–U+1F09F .....	901
Playing Cards: U+1F0A0–U+1F0FF .....	901
Chess Symbols: U+1FA00–U+1FA6F .....	902
Yijing Hexagram Symbols: U+4DC0–U+4DFF .....	903
Tai Xuan Jing Symbols: U+1D300–U+1D356 .....	903
Ancient Symbols: U+10190–U+101CF .....	904
Phaistos Disc Symbols: U+101D0–U+101FF .....	904
<b>22.10 Enclosed and Square</b> .....	906
Enclosed Alphanumerics: U+2460–U+24FF .....	908
Enclosed CJK Letters and Months: U+3200–U+32FF .....	908
CJK Compatibility: U+3300–U+33FF .....	909
Enclosed Alphanumeric Supplement: U+1F100–U+1F1FF .....	909
Enclosed Ideographic Supplement: U+1F200–U+1F2FF .....	910
<b>23 Special Areas and Format Characters</b> .....	913
<b>23.1 Control Codes</b> .....	914
Representing Control Sequences .....	914
Specification of Control Code Semantics .....	915
<b>23.2 Layout Controls</b> .....	917
Line and Word Breaking .....	917
Cursive Connection and Ligatures .....	919
Prepended Concatenation Marks .....	923
Combining Grapheme Joiner .....	924
Bidirectional Ordering Controls .....	926
Stateful Format Controls .....	927
<b>23.3 Deprecated Format Characters</b> .....	929
<b>23.4 Variation Selectors</b> .....	931
<b>23.5 Private-Use Characters</b> .....	934
Private Use Area: U+E000–U+F8FF .....	935
Supplementary Private Use Areas .....	936
<b>23.6 Surrogates Area</b> .....	937
<b>23.7 Noncharacters</b> .....	938

<b>23.8</b>	<b>Specials</b> .....	940
	Byte Order Mark (BOM): U+FEFF .....	940
	Specials: U+FFF0–U+FFF8 .....	942
	Annotation Characters: U+FFF9–U+FFFB .....	942
	Replacement Characters: U+FFFC–U+FFFD .....	944
<b>23.9</b>	<b>Tag Characters</b> .....	945
	Tag Characters: U+E000–U+E007F .....	945
	Deprecated Use for Language Tagging .....	945
<b>24</b>	<b>About the Code Charts</b> .....	947
<b>24.1</b>	<b>Character Names List</b> .....	948
	Images in the Code Charts and Character Lists .....	948
	Special Characters and Code Points .....	950
	Character Names .....	952
	Informative Aliases .....	952
	Normative Aliases .....	953
	Cross References .....	954
	Information About Languages .....	955
	Case Mappings .....	956
	Decompositions .....	956
	Standardized Variation Sequences .....	957
	Positional Forms .....	959
	Block Headers .....	959
	Subheads .....	960
<b>24.2</b>	<b>CJK and Other Ideographs</b> .....	961
	CJK Unified Ideographs .....	961
	Compatibility Ideographs .....	963
	Tangut Ideographs .....	963
<b>24.3</b>	<b>Hangul Syllables</b> .....	965
<b>A</b>	<b>Notational Conventions</b> .....	967
<b>A.1</b>	<b>Typographic Conventions</b> .....	968
	Code Points .....	968
	Character Names .....	968
	Character Blocks .....	968
	Sequences .....	969
	Properties and Property Values .....	969
	Miscellaneous .....	969
	Operators .....	970
<b>A.2</b>	<b>Extended BNF</b> .....	971
	Character Classes .....	971
<b>A.3</b>	<b>Rendering</b> .....	974

<b>B</b>	<b>Unicode Publications and Resources</b> .....	975
<b>B.1</b>	<b>The Unicode Consortium</b> .....	976
	The Unicode Technical Committee .....	976
	Other Activities .....	976
<b>B.2</b>	<b>Unicode Publications</b> .....	977
<b>B.3</b>	<b>Other Unicode Online Resources</b> .....	978
	Unicode Online Resources .....	978
	How to Contact the Unicode Consortium .....	980
<b>C</b>	<b>Relationship to ISO/IEC 10646</b> .....	981
<b>C.1</b>	<b>History</b> .....	982
<b>C.2</b>	<b>Encoding Forms in ISO/IEC 10646</b> .....	990
	Zero Extending .....	990
<b>C.3</b>	<b>UTF-8 and UTF-16</b> .....	991
	UTF-8 .....	991
	UTF-16 .....	991
<b>C.4</b>	<b>Synchronization of the Standards</b> .....	992
<b>C.5</b>	<b>Identification of Features for Unicode</b> .....	993
<b>C.6</b>	<b>Character Names</b> .....	994
<b>C.7</b>	<b>Character Functional Specifications</b> .....	995
<b>D</b>	<b>Version History of the Standard</b> .....	997
<b>E</b>	<b>Han Unification History</b> .....	999
<b>E.1</b>	<b>Development of the URO</b> .....	1000
<b>E.2</b>	<b>Continuing Research on Ideographs</b> .....	1002
	Ideographic Rapporteur Group .....	1002
	Ideographic Research Group .....	1003
<b>E.3</b>	<b>CJK Sources</b> .....	1004
<b>F</b>	<b>Documentation of CJK Strokes</b> .....	1005
<b>I</b>	<b>Index</b> .....	1013